Challenges remain to accessing US federal helium reserves

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An international helium shortage was narrowly avoided last fall with the passage of the Helium Stewardship Act (HSA) of 2013 (reported in the December 2013 issue of the *MRS Bulletin*). Helium is an important non-renewable resource that is used in a variety of industries, and is especially important to materials researchers because of its use in cryogenic and other scientific applications. The community of scientific and industrial helium users supported the passage of the bill in the hopes that it would minimize price fluctuations and shortages to effectively stabilize the helium market.

While there is no question that the HSA averted a helium crisis, nearly a year after its passage it is clear that some hurdles still need to be overcome. In the scientific community many researchers are experiencing price fluctuations as well as difficulty maintaining reliable delivery. Bill Halperin, a professor of physics at Northwestern University, said that buying helium is somewhat analogous to booking a seat on an airplane because "there is no inventory, so it is in the interest of the providers to overbook." Halperin added that because there are only about six major helium providers in the United States, "customer service for small users is not a high priority."

Unfortunately, according to Moses Chan, a professor of physics at The Pennsylvania State University, "only approximately three percent of helium usage is for scientific research." This means that "scientific users have very little leverage in this sector compared to others like medical [MRI], manufacturing, etc.," said Chan. Both Halperin and Chan admit they have fared better than most academic helium users because places like Northwestern and Penn State use sufficient amounts of helium on a regular schedule, making vendors more willing to provide a reliable and cost-competitive supply.

Halperin also noted that since research at Northwestern is largely supported by US federal grants, he has registered the university as an "in-kind" helium user with the Bureau of Land Management (BLM). The in-kind program allows helium providers to obtain helium from the federal helium reserve without restraint for certified users, which should guarantee availability of helium for federally funded research. But "some providers do not recognize or participate in the in-kind program, which might leave a certified user with very little recourse," said Halperin.

Recognizing the difficulties faced by many federally funded helium users, the American Physical Society (APS) and the American Chemical Society have joined together with the US Defense Logistics Agency (DLA) to establish a helium group-purchasing pilot program. According to Mark Elsesser, a policy analyst for APS, "the pilot program will pool academic users and the DLA will act as a broker to hopefully negotiate a better price and more reliable delivery."

Elsesser characterized the initial response to the pilot program as "terrific" and said, "We've heard from approximately 35 groups thus far with the responses ranging from individual professors with no current helium access to an entire university interested in enrolling. Our goal is to form a diverse trial group and we are excited by the range of academics who are interested."

The program accepted applications until early September. At the end of this month the DLA will host an informational session to answer questions and by mid-October, 10 to 15 users will be chosen for the pilot program. "We plan to select a group that is diverse in both location and helium needs—this will provide the best test of the program," said Elsesser. By January the goal is to have sales contracts in place between the DLA and the helium users so that between January and April the DLA can establish contracts with helium providers and users can begin to receive helium in May.

If the pilot program proves successful, it may potentially be expanded to include more helium users in the future. Elsesser said, "The pilot program is an experiment and we recognize that it will not be for everyone. The goal is to determine what users can benefit the most."

While the pilot program is a great way to help some of the most vulnerable helium users, the fact that it takes advantage of the BLM's in-kind program means that when the helium reserve shuts down in 2021 (as stipulated in the HSA) these users will again face difficulties in obtaining helium. Indeed, privatization of the helium market will undoubtedly be a challenging process because helium demand is expected to increase while supply from the reserve will slowly tail off. With the reserve currently supplying 30% of the world's helium needs, new sources will have to be developed to meet demand.

Already several new sources are being developed in the United States, Algeria, Russia, and Qatar, but Halperin said that "these seem to be insufficient to compensate for the projected increase in demand." According to a 2010 report by the National Academies entitled *Selling the Nation's Helium Reserve*, known but untapped reserves in the United States, Russia, and Australia could be developed to fill the gap—but development can be a lengthy process and the seven-year life span granted to the helium reserve by the HSA may not be long enough.

As demand outstrips supply, price increases and helium shortages will become inevitable. And while small-scale users like academic researchers are likely to be impacted first, larger scale industrial users will also face challenges. The passage of the HSA coupled with increased supply—specifically from Qatar—has worked to stabilize the helium market in

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the short term, yielding small but manageable price increases for helium users in the industrial sector.

"Although Texas Instruments [(TI)] has experienced price increases from our helium suppliers [since the passage of the HSA], strong conservation efforts have allowed us to keep our costs stable," said Chad Kaneshige, Worldwide Chemical and Gas Procurement Manager at TI. This reality, echoed by many helium users in the industrial sector, underscores what will hopefully become an important trend—conservation and recycling of helium.

"As prices go up, it will provide more incentive to capture and recycle helium, and industrial users potentially can have the largest impact here," said Chan. "Recycling is also good for laboratory applications because it means you always have a helium reserve on site which allows you to be less impacted by delays in shipments," Chan added. "We must reduce our demand," said Halperin, which can be accomplished through recycling and eliminating helium usage where possible. While these options require significant capital investment, Halperin believes that for small-scale helium users, reducing demand is the "one realistic avenue to pursue."

It is also important to note that helium's role in the research and industrial sectors continues to merit Congressional interest as evidenced by the July 15, 2014 oversight hearing held by the US House Natural Resources Subcommittee on Energy and Mineral Resources to discuss the implementation and administration of the HSA. The hearing examined the initial mandated helium sales from the federal helium reserve, and focused in large part on how the BLM plans to define and regulate access to excess helium refining capacity—an important part of the transition toward a private helium market.

US Bureau of Land Management's crude helium enrichment facility near Amarillo, Texas.

In addition, Subcommittee Chair Doug Lamborn (R-Col.) announced the release of a discussion draft of the American Helium Security Act of 2014. This bill, co-sponsored by House Natural Resources Committee Chair Doc Hastings (R-Wash.), is meant to "secure and encourage future production of domestic helium, ensure helium producers have the regulatory certainty they need to explore for and produce helium on federal lands and facilitate a private domestic market for US helium," said Subcommittee Chair Lamborn.

This bill could have significant impact on the helium market—it would be wise for the community of scientific helium users to monitor and help shape it as it progresses through Congress.

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Plans for European Spallation Source on schedule

http://europeanspallationsource.se

In July, Sweden, Denmark, and Germany announced that funding to build the European Spallation Source (ESS) has been secured, and ESS received approval to start construction. The project is scheduled to break ground just north of Lund, Sweden, in the early autumn, meeting the planned construction phase of 2014–2019.

"Together we achieve more," said Johanna Wanka, German Minister of Education and Research. "We are convinced that major social issues from biology and the life sciences to materials and energy research can be effectively explored in a transnational project with the most modern infrastructure."

As a next-generation facility, ESS is expected to be significantly brighter and more intense than existing facilities. Spallation neutrons in the ESS will be generated by accelerating protons and directing them at a target made of tungsten, which will then release high-energy neutrons. Moderators adjacent to the tungsten target wheel will slow the neutrons down to the cold and thermal energies required for experiments. Moderation inevitably leads to loss of neutron intensity, and moderator design work includes optimizing geometries to minimize losses. By removing restraints on the initial optimization, the ESS Target division found that smaller moderator dimensions tend to increase neutron brightness.

The participating countries are Sweden, Denmark, Czech Republic, Estonia, France, Germany, Iceland, Italy, Hungary, Latvia, Lithuania, The Netherlands, Norway, Poland, Spain, Switzerland, and the United Kingdom, although the amount of contributions is still being finalized. □

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